



National University of Engineering (UNI)
School of Artificial Intelligence
Syllabus 2027-I

1. COURSE

AI268. Computational Vision (Elective)

2. GENERAL INFORMATION

2.1 Course	: AI268. Computational Vision
2.2 Semester	: 9 th Semester.
2.3 Credits	: 4
2.4 Hours	: 2 HT; 4 HP;
2.5 Duration of the period	: 16 weeks
2.6 Type of course	: Elective
2.7 Learning modality	: Face to face
2.8 Prerequisites	: AI264. Deep Learning. (7 th Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

This course covers fundamental techniques for automated analysis of digital images, essential for applications like medical diagnosis, autonomous vehicles, and surveillance systems. Aligns with ACM/ IEEE-CS standards for computer vision.

5. GOALS

- Implement feature extraction and object recognition algorithms using OpenCV/Python.
- Evaluate deep learning methods for semantic segmentation (e.g., Mask R-CNN).

6. COMPETENCES

AG-C08) Problem Analysis: Identifies, formulates, and analyzes complex computing problems. (Usage)

AG-C11) Use of Tools: Applies modern computing tools in problem solving. (Usage)

7. TOPICS

Unit 1: Digital Image Fundamentals (16 hours)	
Competences Expected: AG-C08,AG-C11	
Topics	Learning Outcomes
• Spatial filtering (Gaussian, Sobel) • Geometric and morphological transformations • Color spaces (RGB, HSV, LAB)	• Apply basic image processing operations [Usar] • Calibrate filter parameters for real-world cases [Evaluar]
Readings : [Szeliski10], [Gonzalez18]	

Unit 2: Epipolar Geometry and Reconstruction (16 hours)	
Competences Expected: AG-C08,AG-C11	
Topics	Learning Outcomes
• Fundamental and essential matrices • Triangulation and structure-from-motion • Point clouds with Open3D	• Implement 3D reconstruction pipelines [Usar] • Document technical results in reports [Evaluar]
Readings : [Hartley04]	

Unit 3: Neural Networks for Vision (16 hours)	
Competences Expected: AG-C08,AG-C11	
Topics	Learning Outcomes
• CNN architectures (ResNet, YOLO) • Transfer learning with TensorFlow • Semantic segmentation (U-Net)	• Train models for image classification [Usar] • Collaborate in teams for integrated projects [Usar]
Readings : [He17]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

***** EVALUATION MISSING *****

10. BASIC BIBLIOGRAPHY